

ABSTRACT

## IMAGE PROCESSING APPARATUS

5           In an apparatus and method for creating a computer  
representation of a three-dimensional surface of an  
object, the viewing cones for the camera positions at  
which images of the object were taken are determined and  
the intersection of these viewing cones is used to define  
10   an initial three-dimensional space within which the  
object surface lies. This initial space is divided into  
voxels and each non-occluded voxel is checked for  
photoconsistency by comparing the colours (or average  
colours) of the pixel patches in the various images to  
15   which that voxel can be projected. Any voxels which are  
photo-inconsistent are removed. A voxel may be  
determined to be photo-inconsistent if the average  
colours of the pixel patches are different. Where the  
average colours of the pixel patches are different,  
20   further processing may be carried out before a voxel is  
discarded. Thus, such a voxel may be divided into  
subsidiary voxels each of which is projected into a pixel  
region in each of the images and the voxel only removed  
if there exists no set of pixel regions consisting of a  
25   pixel region taken from each image which is

photoconsistent. In an alternative, the pixels of the pixel patches are each allocated to a specific one of a number of colour value ranges and a voxel is only determined to be photo-inconsistent if the pixel patches do not share at least one colour value range. The steps of projecting the voxels into the images and removing photo-inconsistent voxels are repeated until all non-occluded voxels are photoconsistent, thereby generating a three-dimensional computer representation of the three-dimensional object surface. The resulting voxel space may be stored together with the colour of each non-occluded voxel and the colour of the pixel patch into which each voxel projects in a further image compared with the stored colour for that voxel and any photo-inconsistent voxels removed. This process can then be repeated for a succession of further images. In another arrangement each further image may be compared with a sub-set of the first set to determine the photoconsistency of the voxels.

(Fig. 4)